

REMARKS

Claims 8-15 and 17-26 are pending in the application.

Claims 8-15 and 17-26 are rejected under 35 USC § 112.

Claims 8-15 and 17-26 are rejected under 35 USC § 103(a)

Claims 8, 20 and 25 are amended.

No new matter is added.

Applicants request reconsideration and allowance of the claims in light of the above amendments and following remarks.

Claim Rejections – 35 USC § 112

Claims 8-15 and 17-26 are rejected under 35 USC § 112, first paragraph, as failing to comply with the written description requirement. Specifically, claims 8, 20 and 25 are rejected because the phrase “simultaneously patterning the capping layer and the gate conductive layer” was not described in the specification.

Applicants hereby amend claims 8, 20 and 25 to recite “successively patterning the capping layer and the gate conductive layer.” Support for this amendment can be found at, for example, page 5, lines 26-27 and FIG. 6 of the specification as originally filed. In view of the aforementioned amendment to the claims, Applicants believe claims 8, 20, and 25 to fully comply with the requirements of 35 USC § 112, first paragraph, and request withdrawal of the present rejection.

Claim Rejections – 35 USC § 103

Claims 8, 11-15, 17, 19, 20 and 22-26 are rejected under 35 USC § 103(a) as being allegedly unpatentable over U.S. Patent App. Pub. No. 2002/0196651 to Weis in view of U.S. Patent App. Pub. No. 2006/0035434 to Tabata, et al. (hereinafter “Tabata”). Applicants respectfully traverse this rejection.

Rejecting claims 8, 20, and 25, the Office Action asserts that FIGS. 13-15 of Tabata suggest “successively patterning a capping layer (13, 14) and a gate conductor (7, 10, 12) for the purpose of forming a strip pattern extending across the upper portions of the trenches 4 similarly to a photoresist film.” Applicants respectfully disagree.

Specifically, while FIGS. 13-15 of Tabata illustrate that silicon nitride and silicon oxide films 14 and 13 and poly-crystalline silicon films 10 and 12 are successively patterned, the poly-crystalline silicon films 10 and 12 do not constitute a gate conductor. FIG. 24 of Tabata shows that a gate electrode 18G is formed between adjacent structures P, wherein each structure P includes the patterned poly-crystalline silicon films 10 and 12 and wherein the patterned poly-crystalline silicon films 10 and 12 constitute channel and drain regions 10C and 12D, respectively. See Tabata, paragraph [0076]. In view of the above, Applicants respectfully submit that Tabata teaches sequentially patterning channel and drain regions 10C and 12D, respectively, and forming a gate electrode 18G after the channel and drain regions 10C and 12D have been sequentially patterned. As such, Tabata cannot suggest “successively patterning a capping layer ... and a gate conductor” as suggested in the Office Action. Moreover, the Office Action identifies no specific understanding or principle explaining how the aforementioned teachings of Tabata could suggest “successively patterning a capping layer ... and a gate conductor.” In view of the actual teachings of Tabata, and in the absence of any evidence to the contrary, Applicants respectfully submit that Tabata does not suggest “successively patterning a capping layer ... and a gate conductor.” Because neither Weis nor Tabata teach or suggest each and every element recited in claims 8, 20 and 25, the combination of Weis in view of Tabata fails to render these claims obvious. See M.P.E.P. § 2143.03.

Moreover, the Office Action asserts that Weis discloses “forming a source/drain region 38 ... on both sides of the gate electrode 34.” Applicants respectfully disagree because the structures designated at reference numeral 38 are drain regions only. See Weis, paragraph [0024]. Further, structures designated at reference numeral 28 are source regions. See Weis, paragraph [0023]. As such, Weis discloses forming a source/drain region (28/38) on one side of the gate electrode 34. Because the source/drain region (28/38) of Weis is formed on one side of the gate electrode 34, it cannot be formed on both sides of the gate electrode 34 as recited in claims 8, 20 and 25. Tabata does not provide any teaching which cures this deficiency of Weis. Because neither Weis nor Tabata teach or suggest each and every element recited in claims 8, 20 and 25, the combination of Weis in view of Tabata fails to render these claims obvious. See M.P.E.P. § 2143.03.

Further, the Office Action asserts that Weis discloses “forming a gate dielectric layer ... [32] on ... a bottom of said trench.” Applicants respectfully disagree because the structure

designated at 32 is a trench top oxide layer that “prevent[s] parasitic current leakages.” In view of the above, Applicants respectfully submit that the trench top oxide 32 is not a gate dielectric as asserted in the Office Action. Because the trench top oxide 32 of Weis is not a gate dielectric, Weis does not teach a gate dielectric on a bottom of a trench as recited in claims 8, 20 and 25. Tabata does not provide any teaching which cures this deficiency of Weis. Because neither Weis nor Tabata teach or suggest each and every element recited in claims 8, 20 and 25, the combination of Weis in view of Tabata fails to render these claims obvious. See M.P.E.P. § 2143.03.

Concluding the rejection of claims 8, 20 and 25, the Office Action asserts that it would have been obvious to “modify the method disclosed by Weis as suggested by Tabata because of the desirability to form a strip pattern extended across the upper portions of the trenches similarly to the photoresist film.” Applicants respectfully disagree.

Specifically, FIGS. 1b, 2 and 3 of Weis illustrate a memory cell array including a series of memory cells 2, wherein each memory cell 2 is contacted by a word line 4 (see Weis, paragraph [0020]) and wherein each word line 4 is connected to other memory cells 2 not illustrated in FIG. 2 (see Weis, paragraph [0024]).

In view of the above, Weis clearly discloses that word lines 4 are formed in a strip pattern that extends across upper portions of trenches 20. Because the word lines 4 of Weis, without modification, extend across upper portions of trenches 20, Applicants respectfully submit it would not be desirable to modify Weis using Tabata as proposed simply for the purpose of forming a strip pattern that extends across the upper portions of the trenches. Because neither Weis nor Tabata teach or suggest the desirability of their combination as proposed, the combination of Weis in view of Tabata fails to render claims 8, 20 and 25 obvious. See M.P.E.P. § 2143.01(I).

Lastly, Weis discloses that the memory cell array shown in FIG. 2 is fabricated according to a process which includes, among other steps, the deposition, polishing and recessing of gate poly 34; the formation of a polysilicon stud 35 on the gate poly 34, oxide spacers 46 at sides of the polysilicon stud 35, and bitline contacts 40 on the polysilicon stud 35 and oxide spacers 46; and, subsequently, the formation of a nitride cap 44 on the oxide spacers 46 and surrounding the bitline contacts 40. See Weis, FIGS. 4a-6f and related text. In view of the above, it is clear that the memory array of Weis is fabricated according to a process that requires several steps between

the formation of the polysilicon stud 35 and the formation of the nitride cap 44. Modifying the fabrication process of Weis to ensure that the polysilicon stud 35 and the nitride cap 44 were successively patterned, however, would eliminate the fabrication processes described in FIGS. 4c-6e of Weis. As such, Applicants respectfully submit that modifying Weis using Tabata as proposed would fundamentally change the principles by which the memory cell array of Weis is fabricated and would, therefore, not be obvious. See M.P.E.P. § 2143.01(VI).

Claims 9, 10, 18 and 21 are rejected under 35 USC § 103(a) as being allegedly unpatentable over Weis in view of Tabata and further in view of U.S. 6,482,701 issued to Ishikawa, et al. (hereinafter "Ishikawa"). Applicants respectfully traverse this rejection.

Claims 9, 10, 18 and 21 variously depend from claims 8 and 20 and, therefore, include each and every element recited in claims 8 and 20. As established above, the combination of Weis in view of Tabata fails to render claims 8 or 20 obvious. Moreover, Ishikawa does not provide any teaching which, when combined with Weis in view of Tabata, renders claims 8 or 20 obvious. Accordingly, the combination of Weis in view of Tabata and Ishikawa fails to render claims 9, 10, 18 and 21 obvious for at least the same reasons as presented above with respect to claims 8 and 20.

CONCLUSION

For the foregoing reasons, Applicants request reconsideration and allowance of claims 8-15 and 17-26 of the application as amended. The Examiner is encouraged to telephone the undersigned at (503) 222-3613 if it appears that an interview would be helpful in advancing the case.

Respectfully submitted,

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